**Design of polymeric nanoparticles via photoinduced polymerization-induced self-assembly**

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Soft core-shell polymeric nanoparticles are an area of great research interest due to their potential applications as drug carriers. In this talk, we will present a facile benchtop process for the synthesis of cross-linked polymeric nanoparticles by exploiting wavelength-selective photochemistry to perform orthogonal photoinduced polymerization-induced self-assembly (Photo-PISA) and photo-crosslinking processes. We first established that the water-soluble photocatalyst, zinc meso-tetra(N-methyl-4-pyridyl) porphine tetrachloride (ZnTMPyP) could activate the aqueous PET-RAFT dispersion polymerization of hydroxypropyl methacrylate (HPMA). This photo-PISA process could be conducted under low energy red light (λmax = 595 nm, 10.2 mW/cm2) and without deoxygenation due to the action of the singlet oxygen quencher, which allowed for the synthesis of a range of nanoparticle morphologies (spheres, worms, and vesicles) directly in 96-well plates. To perform wavelength selective nanoparticle cross-linking, we added the photoresponsive monomer, 7-[4-(trifluoromethyl)coumarin] methacrylamide (TCMAm) as a comonomer without inhibiting the evolution of the nanoparticle morphology. Importantly, under red light, exclusive activation of the photo-PISA process occurs, with no evidence of TCMAm dimerization under these conditions. Subsequent switching to a UV source (λmax = 365 nm, 10.2 mW/cm2) resulted in rapid cross-linking of the polymer chains, allowing for retention of the nanoparticle morphology in organic solvents. This facile synthesis of cross-linked spheres, worms, and vesicles demonstrates the utility of orthogonal light-mediated chemistry for performing decoupled wavelength selective chemical processes.